Published in final edited form as:
Am J Geriatr Psychiatry. 2013 December ; 21(12): . doi:10.1016/j.jagp.2013.01.056.

Comorbidity Profile and Health Care Utilization in Elderly Patients with Serious Mental Illnesses

Hugh C. Hendrie, MB, ChB, DSc[1,2,3,4], **Don Hay, MD**[4], **Kathleen A. Lane, MS**[5], **Sujuan Gao, PhD**[5], **Christianna Purnell, BA**[3], **Stephanie Munger, MPH**[2,3], **Faye Smith, MA**[3], **Jeanne Dickens, MD**[4], **Malaz A. Boustani, MD, MPH**[1,2,3], and **Christopher M. Callahan, MD**[1,2,3]

[1]Indiana University School of Medicine, Indianapolis, IN

[2]Indiana University Center for Aging Research, Indianapolis, IN

[3]Regenstrief Institute, Inc., Indianapolis, IN

[4]Indiana University Department of Psychiatry, Indianapolis, IN

[5]Indiana University Department of Biostatistics, Indianapolis, IN

Abstract

Objectives—Patients with serious mental illness are living longer. Yet there remain few studies that focus on health care utilization and its relationship to comorbidities in these elderly mentally ill patients.

Design—Comparative study. Information on demographics, comorbidities and health care utilization were taken from an electronic medical record system.

Setting—Wishard Health Services senior care and community mental health clinics.

Participants—Patients age 65 years and over-255 patients with serious mental illness (schizophrenia, major recurrent depression and bipolar illness) attending a mental health clinic and a representative sample of 533 non-demented patients without serious mental illness attending primary care clinics.

Results—Patients having serious mental illness had significantly higher rates of medical emergency room visits ($p=0.0027$) and significantly longer lengths of medical hospitalizations ($p<0.0001$) than did the primary care control group. The frequency of medical comorbidities such as diabetes, coronary artery disease, congestive heart failure, chronic obstructive pulmonary disease, thyroid disease, and cancer were not significantly different between the groups. Hypertension was lower in the mentally ill group ($p<0.0001$). Reported falls ($p<0.0001$), diagnoses of substance abuse ($p=0.02$), and alcoholism ($p=0.0016$) were higher in the seriously mentally ill. The differences in health care utilization between the groups remained significant after adjusting for comorbidity levels, lifestyle factors, and attending primary care.

Corresponding Author: Hugh C. Hendrie, MB, ChB, DSc, Indiana University Center for Aging Research, 410 West 10th Street, Suite 2000, Indianapolis, IN 46202, hhendri@iupui.edu, Phone: (317) 423-5591, Fax: (317) 423-5695.

Conflicts of Interest: No conflicts of interest declared.

Conclusions—Our findings of higher rates of emergency care, longer hospitalizations, and increased frequency of falls, substance abuse, and alcoholism suggest the elderly seriously mentally ill remain a vulnerable population requiring an integrated model of health care.

Keywords

serious mental illness; comorbidity; health care utilization; elderly patients

Objective

Previous studies on patients with serious mental illness such as chronic schizophrenia, bipolar illness, or chronic recurrent depression, have indicated that these patients have higher mortality rates than persons without serious mental illness (1–5). This discrepancy is at least in part generally explained as being caused by increases in comorbid medical conditions in the mentally ill, particularly chronic illnesses such as diabetes (6–9) and cardiovascular disease (2, 10–14). To alleviate these problems there have been reports of clinical interventions to improve health care in the seriously mentally ill with some success (15, 16). However a recent Cochrane Systematic Review remained unconvinced stating "Guidance and practice are based upon expert consensus, clinical experience, and good intentions, rather than high quality evidence" (17).

Until recently most of these studies have focused on relatively younger patients with serious mental illness, a presumption being that because of the magnitude of mortality differences estimated as leading to a 13 to 30 year shortened life expectancy, few of these patients would survive until old age (1).

However, there is now evidence that the numbers of these elderly mentally ill survivors is increasing, a trend that is likely to continue in the coming decades. A number of recent studies have suggested that these elderly survivors are now facing aging associated health problems in addition to their mental illness including cognitive decline (15, 16, 18–24). One study reported that the greatest expenditures of Medicare/Medicaid were in elderly patients with schizophrenia primarily due to nursing home costs (25).

This paper describes the results of an analysis of the comorbidity levels and health care utilization of a group of elderly patients with lifelong serious mental illness attending a community mental health center by comparing them with a group of elderly primary care patients without serious mental illness attending the same hospital. This analysis was conducted as part of a project designed to improve a system of integrated medical care for these patients. As dementia management is a separate program in this health system, patients with a diagnosis of dementia were excluded from this analysis.

Methods

Facilities

The patients for this study were all attendees of Wishard Health Services. Wishard Health Services is an urban health care system with a 350-bed inpatient service as well as eight community-based primary care practice centers staffed by faculty and residents of Indiana University School of Medicine. It has a senior care center which functions both as a specialty geriatric referral clinic and as a primary care clinic for selected patients. It also has an array of specialty clinics. Additionally, Wishard Health Services includes a large community mental health center, the Midtown Community Mental Health Center. Older adults with mental illnesses are seen primarily in the Older Adult Services division (OAS) of the Midtown Community Mental Health Center, a multidisciplinary clinic staffed by

caseworkers, social workers, clinical nurse specialists, and pharmacists in addition to geriatric psychiatrists.

Subjects

We identified two groups of patients in this study 1) older adults with a history of life long serious mental illness attending OAS and 2) older adults without serious mental illness attending the primary care practices at Wishard Health Services.

Patients with serious mental illness—The seriously mentally ill group included patients with schizophrenia, bipolar illness, and severe recurrent depression identified by the OAS faculty (DL, DH) because they met the following criteria:

1. Over the age of 65 years
2. Evidence that the mental illness began in early adult life
3. No diagnosis of dementia.

A total of 339 patients met these criteria. Because the comparative group consisted of patients attending Wishard primary care clinics, we decided to include in this study only the 255 (75.2%) mentally ill patients who also attended Wishard ambulatory care clinics during either of the years 2008 and 2009. This included 119 (46.7%) patients diagnosed with severe chronic depression, 36 (14.1%) diagnosed with bipolar disorder, and 100 (39.2%) diagnosed with schizophrenia. There were no significant differences in diagnoses between those patients attending or not attending the Wishard clinics (p=0.1954) but the non-attendees were significantly older (mean age: 74.8 vs. 72.8 years; p=0.0375).

Comparison Group—The comparison group consisted of a representative sample of elderly patients attending primary care at Wishard Health Services who were enrolled in the Perceptions Regarding Investigational Screening in Primary Care (PRISM) study from January 2008 to June 2009, a study of the perceptions of the risks and benefits of dementia screening in primary care patients (26). Patients were eligible to participate in PRISM if they were 65 years or older and did not have a diagnosis of dementia or serious mental illness.

Despite the exclusion criteria, the PRISM population of 554 patients included 2 patients each with an ICD-9 diagnosis of either schizophrenia or bipolar illness and 17 patients with an ICD-9 diagnosis of major depression. These were excluded from the comparison leaving 533 patients.

Data

All clinical data were obtained from the Regenstrief Medical Record System, a comprehensive electronic medical record data repository that maintains detailed coded information on all inpatient and outpatient encounters within the Wishard Health Service (27). This information includes physician assisted diagnoses, results of diagnostic studies (e.g. chemistry, hematology, pathology, radiology, echocardiograms) physician orders, prescribed medications, and clinical encounter information including the full text of dictated reports. The electronic medical record was also queried to obtain age as of January 1, 2010, gender, race, marital status, current insurance, smoking history, and a history of substance abuse or alcoholism. Health care utilization was derived for the year 2009. It included number of visits to primary care (PC) clinics in addition to emergency room (ER) visits. Information about hospitalizations for both medical and psychiatric issues included length of stay (LOS) and readmissions within 30 days of prior discharge. To identify existing medical conditions, comorbidities were derived from a combination of clinician problem lists and ICD-9 codes. Comorbidities included diabetes, hypertension, falls, congestive heart failure

(CHF), chronic obstructive pulmonary disease (COPD), arthritis, cancer, coronary artery disease (CAD), liver disease, renal disease, stroke, and thyroid disease, including hyper and hypo-thyroidism. The final comorbidity comparison used a combination of all-time ICD-9 codes and problem lists.

Analysis

Descriptive statistics including means, standard deviations, and ranges for continuous variables and number and percent in each category for categorical variables were calculated for all characteristics in each group. T-tests for continuous data and chi-square tests for categorical data were used to compare the seriously mentally ill and primary care control groups on patient characteristics and compare the seriously mentally ill patients included in this analysis and those not included because they did not make a visit to a Wishard primary care clinic. Multiple logistic regression models were used to compare rates of comorbidities between the seriously mentally ill and primary care control patients each while adjusting for age and gender. Multiple logistic regression models were also used to compare rates of attending primary care clinic, having at least one ER visit, having at least one medical hospitalization and 30-day re-hospitalization following a hospital discharge between the seriously mentally ill and primary care control patients while adjusting for age and gender. Multiple Poisson regression models were used for comparing the two groups on the number of primary care visits in 2009, the total number of comorbidities and total year-long length of stay for medical hospitalizations after adjusting for age and gender. A multiple Poisson regression model with generalized estimating equations to account for multiple hospitalizations per subject was used to compare the groups on the length of stay per hospitalization after adjusting for age and gender. A Fisher's exact test was used to compare the groups on having psychiatric hospitalizations and race.

Logistic regression models were used to identify covariates to include in multiple regression models on having emergency rooms visits and medical hospitalizations. Variables with p-values ≤ 0.15 were included in multiple logistic regression models with indicator variables for the group and having primary care visits in 2009. Stepwise model-fitting strategies were used to identify a final parsimonious model. Using the final model, an interaction between the group and having primary care visits in 2009 was explored but removed if not significant at the alpha=0.05 level.

All analyses were repeated after separating the mentally ill cohort into the three types of illnesses the patients suffered from and comparing each of them against the primary control patients. Analysis was performed using SAS version 9.3.

Results

The comparisons of patient characteristics in the two groups are shown in Table 1. The seriously mentally ill patients were significantly younger than the primary care control patients, more likely to be female, less likely to be African American, more likely to be single or divorced, more likely to have Medicaid and more likely to have a history for substance and alcohol abuse ($p<0.05$ for all).

A comparison of the comorbidity profile is shown in table 2. The comorbidity rates were very similar between the two groups after adjusting for age and gender. The seriously mentally ill patients had significantly lower rates of hypertension but significantly higher rates of falls ($p<0.0001$ for both). The average number of comorbidities were similar for the two groups (seriously mentally ill (mean ± SD): 3.9 ± 2.2, median 4; primary care controls: 4.1 ± 1.9; median 4; adjusted p-value=0.4634).

The facility use comparison of the two groups for the year 2009 is shown in Table 3. The seriously mentally ill patients were significantly less likely to have attended primary care clinics than the primary care control patients, although for those patients who did attend, the seriously mentally ill patients attended more frequently (p=0.0003).

Significantly more seriously mentally ill patients had visits to the emergency room and had medical hospitalizations than did the primary care control patients (p<0.05 for both). In addition, the seriously mentally ill patients had longer lengths of stay per year and per hospitalization than did the primary care control patients (p<0.01 for both). Finally, the seriously mentally ill patients had significantly more psychiatric hospitalizations than the primary care control patients, who had no psychiatric hospitalizations recorded (p<0.0001). The rate of psychiatric hospitalizations was less frequent than the medical hospitalizations. There was no difference between the groups on 30-day readmission for medical hospitalizations (p=0.6141).

In univariate logistic regression models on the outcomes of having emergency rooms visits and medical hospitalizations, having attended a primary care clinic in 2009 and having a history of diabetes, hypertension, falls, CHF, COPD, arthritis, cancer, CAD, renal disease, and stroke were significantly associated with an emergency room visit (p<0.05 for all). In addition, not being Caucasian, having thyroid disease, having hyper and hypothyroidism, and being an alcoholic were also marginal risk factors for this outcome (0.05<p<0.15). For the outcome of having medical hospitalizations, the comorbidities of falling, CHF, COPF, cancer, CAD, renal disease, and stroke were significant risks (p<0.05) while diabetes, hypertension and substance abuse were marginal risks (0.05<p<0.15).

Table 4 describes the results from the final multiple logistic regression models examining the differences between the seriously mentally ill and primary care control groups on emergency room visits and medical hospitalizations while adjusting for other significant covariates including demographics, marital status. and comorbidities. The seriously mentally ill patients were significantly more likely to have an emergency room visit (p=0.0002) after adjusting for covariates including having a primary care visit in 2009, being non-Caucasian (primarily African-American), having a history of falls, congestive heart failure, chronic obstructive pulmonary disease, and stroke. There was no significant interaction between the group and having attended a primary care clinic in 2009 (p=0.9553). Adding Medicaid status to the final model did not change the association as the seriously mentally ill patients were still significantly more likely to have an emergency room visit (OR=1.55, 95% CI: 1.08–2.22, p=0.0173).

In the second model shown in table 4, again seriously mentally ill patients were significantly more likely to have medical hospitalizations in 2009 (p=0.0178) after adjusting for other covariates, but having a primary care visit in 2009 was not associated with medical hospitalization (p=0.9133). However, having congestive heart failure, COPD, cancer, CAD, renal disease and substance abuse all increased the likelihood of a hospitalization (p<0.05 for all). An interaction between the group and having attended a primary care clinic in 2009 was investigated but was not significant (p=0.2974). After adding Medicaid status to the final model for medical hospitalizations the seriously mentally ill patients and the primary care control patients were no longer significantly different (OR=1.27, 95% CI: 0.83–1.94, p=0.2658). Comparisons were also made between each of the three illness groups (bipolar illness (n=36), recurrent major depressive disorder (n=119), schizophrenia (n=100)) and the primary care controls. Schizophrenic patients tended to be more often African American than the bipolar and depressed patients, but comparable to the primary care patients. Schizophrenic patients were more likely to be single than the other groups. The four patient groups were not different in rates of diabetes, COPD, cancer, liver disease, or renal disease.

However, all three mental illness groups had lower rates of hypertension and higher rates of falls. Patients with major depressive disorder had higher comorbidity in congestive heart failure, arthritis, coronary artery disease, and stroke compared to the other mentally ill patients.

With regard to facility use a similar pattern was observed between the three illness groups and the primary care controls as described above for the seriously mentally ill. All three mental illness groups were less likely to attend primary care clinics and more likely to have ER visits than the primary care controls. All illness groups had greater numbers of hospitalizations and lengths of stay than did the primary care controls.

In the final multiple logistic regression models adjusting for other significant comorbidities as described above for the seriously mentally ill, odds ratios for ER visits were similar in the three mental illness groups compared to primary care patients (OR=1.98 for bipolar patients, p=0.085; OR=1.89 for depression, p=0.0054; and OR=1.91 for schizophrenia, p=0.0095). The odds ratios comparing each of the three mental illness groups to primary care patients for medical hospitalizations were: bipolar patients-2.10 (p=0.085), depression-1.46 (p=0.15) and schizophrenia-1.74 (p=0.070).

The complete tables for the mental illness analyses are available on the journal's web site.

Conclusions

In this analysis, diagnoses of substance abuse and alcoholism were more frequent in the seriously mentally ill patients (OAS) than in the primary care control group (PRISM) as has been reported in other studies (28–30). However the frequencies of most comorbid medical conditions including such chronic conditions as diabetes and hypertension for the seriously mentally ill patients (OAS), although high, were similar to those in our comparative group of medical outpatient attendees (PRISM). In fact, the hypertension frequency was significantly lower in OAS patients than in the control group (OAS hypertension 83.1%, PRISM hypertension 93.4%). This is in stark contrast to the current literature among younger patients which suggests that the prevalence of several comorbid medical conditions, including obesity, diabetes, and symptoms of cardiovascular disease and respiratory disease, is at least two times higher in seriously mentally ill patients than the general population (1, 31, 32). These findings might support the concept that these elderly mentally ill patients do represent a survivor cohort, the excess of comorbidities identified in the younger groups being partially responsible for their greater mortality risk. The clinical data represent information recorded by the physicians. It is possible that higher levels of comorbidity did exist in the seriously mentally ill patients but that they were under-identified by the attending physicians because information from caregivers is often lacking and these patients are difficult to evaluate. Antipsychotic medication has been associated with hypotension through its alpha-blocking properties (33, 34). As the seriously mentally ill were more likely to be receiving these medications it is possible that this accounts for some of the differences between the groups. The finding that falls were significantly more common in the seriously mentally ill (OAS 32.2%, PRISM 18.6%, p<0.0001) also suggests that this survivor cohort of mentally ill patients will now have to face the consequences of aging, such as falls, which represent a major contributor to morbidity in the elderly (35) and indeed may be particularly vulnerable to them (36–38). Even after adjusting for demographics and comorbidities including alcohol use and substance abuse, the seriously mentally ill group was significantly likely to experience falls (OR 2.16, CI 1.52–3.08, p<0.002). The other major contributor to morbidity and mortality in the elderly, dementia, was not included in this study. When the comorbidity comparisons involve the three seriously mentally ill diagnostic groups separately (bipolar illness, schizophrenia and major depressive disorder) all three groups

have lower rates of hypertension and higher rates of falls than the primary care controls. Within the mental illness diagnostic groups patients with major depressive disorders had higher rates of congestive heart failure, coronary artery disease and stroke than did the other two groups (10).

The analysis of medical health care utilization is also consistent with the concept of continuing vulnerability even in this elderly survivor cohort. In our study, the seriously mentally ill patients from the mental health clinic attended primary care clinics significantly less often than did our comparison group. The seriously mentally ill patients did have significantly more medical emergency clinic visits (OAS 49.0%, PRISM 37.7%, $p=0.0027$) as well as more hospitalizations and longer hospital lengths of stay than did the primary care comparison group (OAS 3.1±9.6, PRISM 1.3±4.3, $p<0.0001$). In contrast to the hospitalizations for medical reasons (23.9%), hospitalizations to psychiatric wards were much less frequent for the seriously mentally ill patients (5.9%) and no psychiatric hospitalization was recorded for the comparison group.

When models to examine the association between medical emergency room visits are considered, the presence of medical comorbidities such as CHF, COPD, stroke, and hypertension increase their likelihood, but as there was no difference in frequency between the seriously mentally ill and non-mentally ill, this was unlikely to be a major contributor to the group differences. It is noteworthy that falls which did occur significantly more frequently in the mentally ill also increased the likelihood of emergency room care. It was surprising that attendance at a primary care clinic was associated with increased likelihood of emergency visits but this may reflect the possibility that entrance to a primary care clinic is sometimes precipitated by an emergency room visit for the mentally ill. Even when all these factors are considered, however, being chronically mentally ill was associated with an increased number of emergency room visits as is found in younger patients (39).

Similarly, in the model for medical hospitalization, comorbidities such as CHF, COPD, cancer, CAD and renal disease significantly increased the likelihood of hospitalization but did not differ between study groups. Substance abuse, which was more common in the mentally ill, also significantly increased hospitalization. However, even when all of these factors are considered, chronic mental illness increased the length of medical hospitalization as has previously been noted in younger populations (40). It is possible that a combination of factors not entirely captured in this study such as residual psychiatric symptoms, cognitive decline, use of psychotropic medication and physician discomfort in dealing with the mentally ill account for the differences in both medical hospitalizations and emergency room visits (1, 40). It may also be a function of the accompanying socioeconomic circumstances of the seriously mentally ill involving their living arrangements and lack of social support. Medicaid status could be used as a surrogate for socioeconomic status. When Medicaid is added to the model the difference between the two groups for medical hospitalizations is no longer significant. However the differences between the two groups for emergency room visits remained significant. This supports the concept that socioeconomic status could explain at least some of the increased use of medical facilities in the seriously mentally ill. There remains, however, the likelihood that socioeconomic status is itself affected by having a serious mental illness (41). The pattern of facility use was similar for all three mental illness diagnostic groups when compared to primary care controls as described for the combined seriously mentally ill cohort.

There are as yet few studies focusing exclusively on the aging mentally ill. However the longitudinal studies of Jeste and his colleagues with chronic schizophrenic patients suggest that the aging process may differ in the mentally ill with accelerated physical aging but improved psychosocial functioning including diminished psychotic symptoms (42). Similar

findings have been reported for elderly patients with bipolar illnesses (43). This latter phenomenon may explain our finding of relatively low rates of psychiatric hospitalization in our elderly mentally ill patients compared to the younger group. More comprehensive longitudinal evaluations of the elderly mentally ill which include their possible transition to dementia and assessment of their health care utilization and nursing home use are indicated to assess the extent of their continuing vulnerability and its potential public health impact.

The strength of this study is that it focuses exclusively on the elderly seriously mentally ill and uses a data set that is a complete and accurate reflection of all medical care provided to all patients in our study within the targeted health care system. Another strength is the ability to compare older adults with and without lifelong serious mental illness using data from an electronic system common to both groups.

There are some weaknesses in this analysis. The comparison group was drawn from patients attending primary care clinics so it may not be a representative sample of all non-mentally ill elderly patients. Although the PRISM sample did not differ from the remainder of the primary care patients demographically, they were volunteers. While an attempt was made to exclude patients with dementia, it is possible that the cohorts included patients with less severe forms of cognitive impairment such as mild cognitive impairment or even cases of unrecognized dementia. The analysis of health care utilization was conducted over a relatively short period of time (one year). There was no information on about 25% (84) of the OAS patients who did not attend the Wishard facilities. Although they did not differ in diagnostic categories from those included in the study, they were significantly older. It is possible comorbidity levels were higher in these patients. Psychotropic medication use was not included. Information on the living arrangements and the availability of social support was limited. This analysis was also confined to patients attending a health system which administers both the mental health and health components of care, perhaps reducing the generalizability of these results.

In summary, in this analysis of the elderly seriously mentally ill, the similarity of the comorbidity profiles for chronic illnesses do suggest that they represent a survivor cohort. However, the increased likelihood of falls together with the significantly greater number of emergency room visits and length of hospitalization also suggest that they represent a vulnerable elderly population that deserve more intensive studies leading hopefully to a better integrated model of medical and psychiatric care including consideration of psychosocial factors (15).

Acknowledgments

We would like to acknowledge the contribution of Donald Lindgren, LCSW, to this project. In his role as Manager of Older Adult and Residential Services at Midtown Community Health Services, his dedication to the care of the elderly mentally ill was an inspiration to all who met him. He died suddenly before the manuscript was submitted.

Source of Funding: This study was supported by NIH grant number R24MH080827-01A1.

References

1. De Hert M, Cohen D, Bobes J, et al. Physical illness in patients with severe mental disorders. II. Barriers to care, monitoring and treatment guidelines, plus recommendations at the system and individual level. World Psychiatry. 2011; 10:138–151. [PubMed: 21633691]
2. Brown S, Kim M, Mitchell C, et al. Twenty-five year mortality of a community cohort with schizophrenia. Br J Psychiatry. 2010; 196:116–121. [PubMed: 20118455]

3. Chwastiak LA, Rosenheck RA, Desai R, et al. Association of psychiatric illness and all-cause mortality in the National Department of Veterans Affairs Health Care System. Psychosom Med. 2010; 72:817–822. [PubMed: 20639387]
4. Kilbourne AM, Morden NE, Austin K, et al. Excess heart-disease-related mortality in a national study of patients with mental disorders: identifying modifiable risk factors. Gen Hosp Psychiatry. 2009; 31:555–563. [PubMed: 19892214]
5. Laursen TM, Munk-Olsen T, Nordentoft M, et al. Increased mortality among patients admitted with major psychiatric disorders: a register-based study comparing mortality in unipolar depressive disorder, bipolar affective disorder, schizoaffective disorder, and schizophrenia. J Clin Psychiatry. 2007; 68:899–907. [PubMed: 17592915]
6. Brown LC, Majumdar SR, Newman SC, et al. History of depression increases risk of type 2 diabetes in younger adults. Diabetes Care. 2005; 28:1063–1067. [PubMed: 15855568]
7. Bushe C, Holt R. Prevalence of diabetes and impaired glucose tolerance in patients with schizophrenia. Br J Psychiatry Suppl. 2004; 184:S67–S71. [PubMed: 15056596]
8. van Winkel R, De Hert M, Van Eyck D, et al. Screening for diabetes and other metabolic abnormalities in patients with schizophrenia and schizoaffective disorder: evaluation of incidence and screening methods. J Clin Psychiatry. 2006; 67:1493–1500. [PubMed: 17107239]
9. van Winkel R, De Hert M, Van Eyck D, et al. Prevalence of diabetes and the metabolic syndrome in a sample of patients with bipolar disorder. Bipolar Disord. 2008; 10:342–348. [PubMed: 18271914]
10. Brown AD, Barton DA, Lambert GW. Cardiovascular abnormalities in patients with major depressive disorder: autonomic mechanisms and implications for treatment. CNS Drugs. 2009; 23:583–602. [PubMed: 19552486]
11. Colton CW, Manderscheid RW. Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. Prev Chronic Dis. 2006; 3:A42. [PubMed: 16539783]
12. Laursen TM, Munk-Olsen T, Agerbo E, et al. Somatic hospital contacts, invasive cardiac procedures, and mortality from heart disease in patients with severe mental disorder. Arch Gen Psychiatry. 2009; 66:713–720. [PubMed: 19581562]
13. Saha S, Chant D, McGrath J. A systematic review of mortality in schizophrenia: is the differential mortality gap worsening over time? Arch Gen Psychiatry. 2007; 64:1123–1131. [PubMed: 17909124]
14. Hennekens CH, Hennekens AR, Hollar D, et al. Schizophrenia and increased risks of cardiovascular disease. Am Heart J. 2005; 150:1115–1121. [PubMed: 16338246]
15. Bartels SJ, Forester B, Mueser KT, et al. Enhanced skills training and health care management for older persons with severe mental illness. Community Ment Health J. 2004; 40:75–90. [PubMed: 15077730]
16. Druss BG, Rohrbaugh RM, Levinson CM, et al. Integrated medical care for patients with serious psychiatric illness: a randomized trial. Arch Gen Psychiatry. 2001; 58:861–868. [PubMed: 11545670]
17. Tosh G, Clifton A, Mala S, et al. Physical health care monitoring for people with serious mental illness. Cochrane Database Syst Rev. 2010 CD008298.
18. Copeland LA, Parchman ML, Zeber JE, et al. Prediabetes assessment and follow-up in older veterans with schizophrenia. Am J Geriatr Psychiatry. 2010; 18:887–896. [PubMed: 20808110]
19. Depp CA, Davis CE, Mittal D, et al. Health-related quality of life and functioning of middle-aged and elderly adults with bipolar disorder. J Clin Psychiatry. 2006; 67:215–221. [PubMed: 16566616]
20. Gilmer TP, Folsom DP, Hawthorne W, et al. Assisted living and use of health services among medicaid beneficiaries with schizophrenia. J Ment Health Policy Econ. 2003; 6:59–65. [PubMed: 14578538]
21. Howard RJ. Schizophrenia in later life: emerging from the shadows. Am J Geriatr Psychiatry. 2010; 18:859–861. [PubMed: 20808149]
22. Zeber JE, Copeland LA, Grazier KL. Serious mental illness, aging, and utilization patterns among veterans. Mil Med. 2006; 171:619–626. [PubMed: 16895128]

23. Harvey PD, Czaja SJ, Loewenstein DA. Schizophrenia in later life. Am J Geriatr Psychiatry. 2012; 20:1–4. [PubMed: 22104378]
24. Loewenstein DA, Czaja SJ, Bowie CR, et al. Age-associated differences in cognitive performance in older patients with schizophrenia: a comparison with healthy older adults. Am J Geriatr Psychiatry. 2012; 20:29–40. [PubMed: 22130385]
25. Bartels SJ, Clark RE, Peacock WJ, et al. Medicare and medicaid costs for schizophrenia patients by age cohort compared with costs for depression, dementia, and medically ill patients. Am J Geriatr Psychiatry. 2003; 11:648–657. [PubMed: 14609805]
26. Fowler NR, Boustani M, Frame A, et al. Impact of Patients' Perceptions on Dementia Screening in Primary Care. Journal of the American Geriatrics Society. 2012 in press.
27. McDonald CJ, Overhage JM, Tierney WM, et al. The Regenstrief Medical Record System: a quarter century experience. Int J Med Inform. 1999; 54:225–253. [PubMed: 10405881]
28. Kerfoot KE, Rosenheck RA, Petrakis IL, et al. Substance use and schizophrenia: Adverse correlates in the CATIE study sample. Schizophr Res. 2011
29. Martins SS, Gorelick DA. Conditional substance abuse and dependence by diagnosis of mood or anxiety disorder or schizophrenia in the U.S. population. Drug Alcohol Depend. 2011
30. Gao K, Chan PK, Verduin ML, et al. Independent predictors for lifetime and recent substance use disorders in patients with rapid-cycling bipolar disorder: focus on anxiety disorders. Am J Addict. 2010; 19:440–449. [PubMed: 20716307]
31. Vinogradova Y, Coupland C, Hippisley-Cox J, et al. Effects of severe mental illness on survival of people with diabetes. Br J Psychiatry. 2010; 197:272–277. [PubMed: 20884949]
32. Scott D, Happell B. The high prevalence of poor physical health and unhealthy lifestyle behaviours in individuals with severe mental illness. Issues Ment Health Nurs. 2011; 32:589–597. [PubMed: 21859410]
33. Muench J, Hamer AM. Adverse effects of antipsychotic medications. Am Fam Physician. 2010; 81:617–622. [PubMed: 20187598]
34. Bymaster FP, Calligaro DO, Falcone JF, et al. Radioreceptor binding profile of the atypical antipsychotic olanzapine. Neuropsychopharmacology. 1996; 14:87–96. [PubMed: 8822531]
35. Hanley A, Silke C, Murphy J. Community-based health efforts for the prevention of falls in the elderly. Clin Interv Aging. 2011; 6:19–25. [PubMed: 21472088]
36. Stubbs B. Falls in older adult psychiatric patients: equipping nurses with knowledge to make a difference. J Psychiatr Ment Health Nurs. 2011; 18:457–462. [PubMed: 21539692]
37. Coupland C, Dhiman P, Morriss R, et al. Antidepressant use and risk of adverse outcomes in older people: population based cohort study. BMJ. 2011; 343:d4551. [PubMed: 21810886]
38. Lavsa SM, Fabian TJ, Saul MI, et al. Influence of medications and diagnoses on fall risk in psychiatric inpatients. Am J Health Syst Pharm. 2010; 67:1274–1280. [PubMed: 20651318]
39. Small LF. Determinants of physician utilization, emergency room use, hospitalizations among populations with multiple health vulnerabilities. Health (London). 2011; 15:491–516. [PubMed: 21169208]
40. Zolnierek CD. Non-psychiatric hospitalization of people with mental illness: systematic review. J Adv Nurs. 2009; 65:1570–1583. [PubMed: 19493137]
41. Aro S, Aro H, Keskimaki I. Socio-economic mobility among patients with schizophrenia or major affective disorder. A 17-year retrospective follow-up. Br J Psychiatry. 1995; 166:759–767. [PubMed: 7663824]
42. Jeste DV, Wolkowitz OM, Palmer BW. Divergent trajectories of physical, cognitive, and psychosocial aging in schizophrenia. Schizophr Bull. 2011; 37:451–455. [PubMed: 21505111]
43. Sajatovic M, Chen P. Geriatric bipolar disorder. Psychiatr Clin North Am. 2011; 34:319–333. vii. [PubMed: 21536161]

Table 1

Baseline Characteristics of the Two Groups

Characteristic	***Seriously Mentally Ill (n=255)***		***Primary Care Controls (n=533)***		***p-value***
	N	**Mean ± SD/ n (%)**	**N**	**Mean ± SD/ n (%)**	
Age as of 1/1/2010, mean ± SD	255	72.84 ± 6.19	533	74.57 ± 6.17	0.0002
Female Gender, n (%)	255	199 (78.0%)	533	375 (70.4%)	0.0233
Race, n(%)	238		529		<0.0001
Caucasian		122 (51.3%)		215 (40.6%)	
African-American		108 (45.4%)		313 (59.2%)	
Hispanic		7 (2.9%)		0 (0.0%)	
Multi-Racial		1 (0.4%)		0 (0.0%)	
Other		0 (0.0%)		1 (0.2%)	
Marital status, n (%)	253		532		0.0021
Single		65 (25.7%)		101 (19.0%)	
Married		39 (15.4%)		134 (25.6%)	
Divorced		71 (28.1%)		112 (21.1%)	
Widowed		76 (30.0%)		174 (32.7%)	
Separated		2 (0.8%)		11 (2.1%)	
On Medicaid	255	193 (75.7%)	533	22 (41.7%)	<0.0001
On Medicare	255	245 (96.1%)	533	508 (95.3%)	0.6240
History of Smoking, n (%)	120	48 (40.0%)	229	68 (29.7%)	0.0522
Substance abuse, n (%)	255	13 (5.1%)	533	11 (2.1%)	0.0204
Alcohol abuse, n (%)	255	40 (15.7%)	533	44 (8.3%)	0.0016

Table 2

Comorbidity Characteristics of the Two Groups

Comorbidity	***Seriously Mentally Ill (n=255)***	***Primary Care Controls (n=533)***	***p-value****
Diabetes	110 (43.1%)	251 (47.1%)	0.1430
Hypertension	212 (83.1%)	498 (93.4%)	<0.0001
Falls	82 (32.2%)	99 (18.6%)	<0.0001
Congestive Heart Failure	74 (29.0%)	147 (27.6%)	0.4581
Chronic Obstructive Pulmonary Disease	70 (27.5%)	142 (26.6%)	0.8260
Disease			
Arthritis	132 (51.8%)	295 (55.3%)	0.5327
Cancer	77 (30.2%)	162 (30.4%)	0.9990
Coronary Artery Disease	73 (28.6%)	174 (32.6%)	0.4085
Liver disease	19 (7.5%)	57 (10.7%)	0.1156
Renal disease	40 (15.7%)	121 (22.7%)	0.0707
Stroke	43 (16.9%)	96 (18.0%)	0.8374
Hyperthyroid	22 (8.6%)	38 (7.1%)	0.5225
Hypothyroid	62 (24.3%)	99 (18.6%)	0.1403
Thyroid disease (including hyperthyroid and/or hypothyroid)	67 (26.3%)	119 (22.3%)	0.3367

*p-value adjusted for gender and age at 1/1/2010

Am J Geriatr Psychiatry. Author manuscript; available in PMC 2014 December 01.

Table 3

Facility Use Data in 2009 by the Two Groups

	Seriously Mentally Ill (n=255)		***Primary Care Controls (n=533)***		***p-value****
	N	**Mean ± SD/ n (%)**	**N**	**Mean ± SD/ n (%)**	
Clinic and ER Visits					
Attended Primary Care clinics, n (%)	255	191 (74.9%)	533	494 (92.7%)	<0.0001
Number of Visits to Primary Care Clinics per Attendee, mean ± SD (range)	191	5.3 ± 3.4 (1–16)	494	4.3 ± 3.0 (1–30)	<0.0001
Had Medical ER visit, n (%)	255	125 (49.0%)	533	201 (37.7%)	0.0027
Medical Hospitalizations					
Had Medical Hospitalization, n (%)	255	61 (23.9%)	533	91 (17.1%)	0.0215
Length of Stay per Medical Hospitalization, mean ± SD (range)	94	8.3 ± 8.2 (1–31)	139	5.0 ± 4.5 (1–32)	0.0020
Total Length of Stay per person, mean ± SD (range)	255	3.1 ± 9.6 (0.87)	533	1.3 ± 4.3 (0–38)	<0.0001
Subjects with 30 day Readmissions for Medical Hospitalization, n (%)	61	11 (18.0%)	91	19 (20.9%)	0.6141
Psychiatric Hospitalizations					
Had Psychiatric Hospitalization, n (%)	255	15 (5.9%)	533	0 (0.0%)	<0.0001**
Length of Stay per Psychiatric Hospitalization, mean ± SD (range)	19	8.6 ± 10.0 (1–42)	0	NA	NA
Total Length of Stay per person, mean ± SD (range)	255	0.6 ± 3.6 (1–42)	0	NA	NA
Subjects with 30 day Readmissions for Psychiatric Hospitalization, n (%)	15	1 (6.7%)	0	NA	NA

*p-value adjusted for gender and age unless stated otherwise

**unadjusted p-value from Fisher's exact test

Table 4

Results from Final Multiple Logistic Regression Models on Having Medical ER visits and Medical Hospitalizations in 2009

effect	Odds Ratio	95% CI	P-value
Having ER Visit			
Seriously Mentally Ill vs. Primary Care Controls	1.91	1.35–2.69	0.0002
Has Primary Visits vs. No Visits	2.22	1.32–3.75	0.0028
Not Caucasian Race vs. Caucasian	1.93	1.38–2.68	0.0001
Falls	1.83	1.27–2.64	0.0012
Congestive Heart Failure	1.86	1.33–2.61	0.0003
Chronic Obstructive Pulmonary Disease	2.32	1.62–3.32	<.0001
Stroke	2.06	1.38–3.07	0.0004
Medical Hospitalizations			
Seriously Mentally Ill vs. Primary Care Controls	1.63	1.09–2.43	0.0178
Has Primary Care Visits vs. No Visits	1.03	0.58–1.84	0.9133
Congestive Heart Failure	2.90	1.91–4.39	<.0001
Chronic Obstructive Pulmonary Disease	1.97	1.32–2.94	0.0009
Cancer	1.65	1.11–2.45	0.0128
Coronary Artery Disease	1.65	1.09–2.49	0.0173
Renal Disease	1.88	1.22–2.90	0.0040
Substance abuse	3.21	1.28–8.06	0.0130